Here’s some advice

Advising help for Spring 2025 courses

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- Degreeworks: what gen ed courses do you need to take?
  - General Education Requirements
- Degreeworks: what CS courses do you need to take?
  - CS Requirements
- Degreeworks: what are fall-through courses?
  - Fall through courses
- Degreeworks: how do you view requirements of certificates and minors?
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- Are you thinking about dropping or repeating a course?
  - Drops versus Repeats
- Can I do a study abroad?
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- Are you looking for additional credential? You can earn a Data Science certificate with one extra course
  - Academic Option: Data Science Certificate
- Are you an excellent student? Do you want to make yourself even more marketable? Are you interested in an academic career?
  - Academic Option: Accelerated Bachelors to Masters
- Are you looking for an academic challenge in your undergraduate degree?
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- Are you interested in a minor? You can earn a Math minor with one extra course and a cybersecurity minor with three extra courses.
  - Academic Options: Minors
- How to I add or change a minor/certificate/major?
  - Adding/changing major/minor/certificate
- Are you interested in an internship? You should be. In addition to money, experience, and a chance at full-time employment, you can earn CS elective credit for an internship.
  - Internships
- How many classes do I need to take in a semester to graduate in four years?
  - How many classes should I take?

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- When can I register?
  - Registration
- How can I tell if I have the prerequisites for a course?
  - Prerequisites
- When/how do apply for graduation?
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- What CS courses will be offered in Spring 2025?
  - Spring 2025 Computer Science courses
- Can I take graduate courses?
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- What honors courses will be offered in Spring 2025?
  - Spring 2025 Graduate courses
- What Data Science courses will be offered in Spring 2025?
  - Spring 2025 Data Science courses
- What CS courses will be offered in Summer 2025?
  - Summer 2025 Computer Science courses
- Ready for your PIN?
  - Completion Form

General Education Requirements INCOMPLETE

Catalog year: 2020-2021

----- For detailed General Education Program of Study information, click here -----

	Course	Title	Grade	Credits	Term	Repeated
FINE ARTS (FA) DESIGNATION MET						
HISTORICAL STUDIES (HS) DESIGNATION MET						
LITERARY STUDIES (LS) DESIGNATION MET						
SOCIAL SCIENCES (SS) DESIGNATION MET						
First Year Seminar	UCO 1200	LAND CONSERVATION IN NC MTNS	A	3	Spring 2021	
First Year Writing	R_C 1000	EXPOSITORY WRITING	A	3	Fall 2020	
Second Year Writing	R_C 2001	INTR WRITING ACROSS CURRICULUM	B+	3	Spring 2022	
Quantitative Literacy	C_S 2435	INTRO TO SCIENTIFIC PROGRAM	B-	4	Fall 2020	
Wellness Literacy	P_E 1754	WEIGHT TRAINING	B+	1	Spring 2022	
	P_E 1876	ALPINE SNOWBOARDING	A	1	Spring 2023	
INTEGRATIVE LEARNING EXPERIENCE (ILE)						
Appalachian Mountains: Community, Culture, and Land	A_S 2016	APPALACHIAN MUSIC	A	3	Spring 2023	
	A_S 2200	APPALACHIAN STORIES	A	3	Fall 2022	
	A_S 2411	APPALACHIA: AN INTRODUCTION	A	3	Spring 2023	
LIBERAL STUDIES EXPERIENCE (LSE) (AT LEAST THREE DISCIPLINE PREFIXES)						
Liberal Studies Experience	HIS 1102	WORLD CIVILIZATION II	P C	3	Fall 2020	
	R_M 2100	LEISURE IN SOCIETY	--	(3)	Fall 2023	
	Still needed:	You have taken 6 credit(s) and need 6 more in this area.				
SCIENCE INQUIRY						
Voyages Through the Cosmos	AST 1001	INTR ASTRO I/SOLAR SYST	B	4	Fall 2021	
	AST 1002	INT ASTRO II/STAR GALAX	C-	4	Spring 2022	

Notice the link to get information about the gen ed requirements

Themes are chosen Appalnet. When you choose a science inquiry, make sure it also meets CS requirements

Choose gen courses that meet both the “experience” and a “designation”

Appears wherever you have a requirement left to meet
(A discipline prefix is HIS or CS.)

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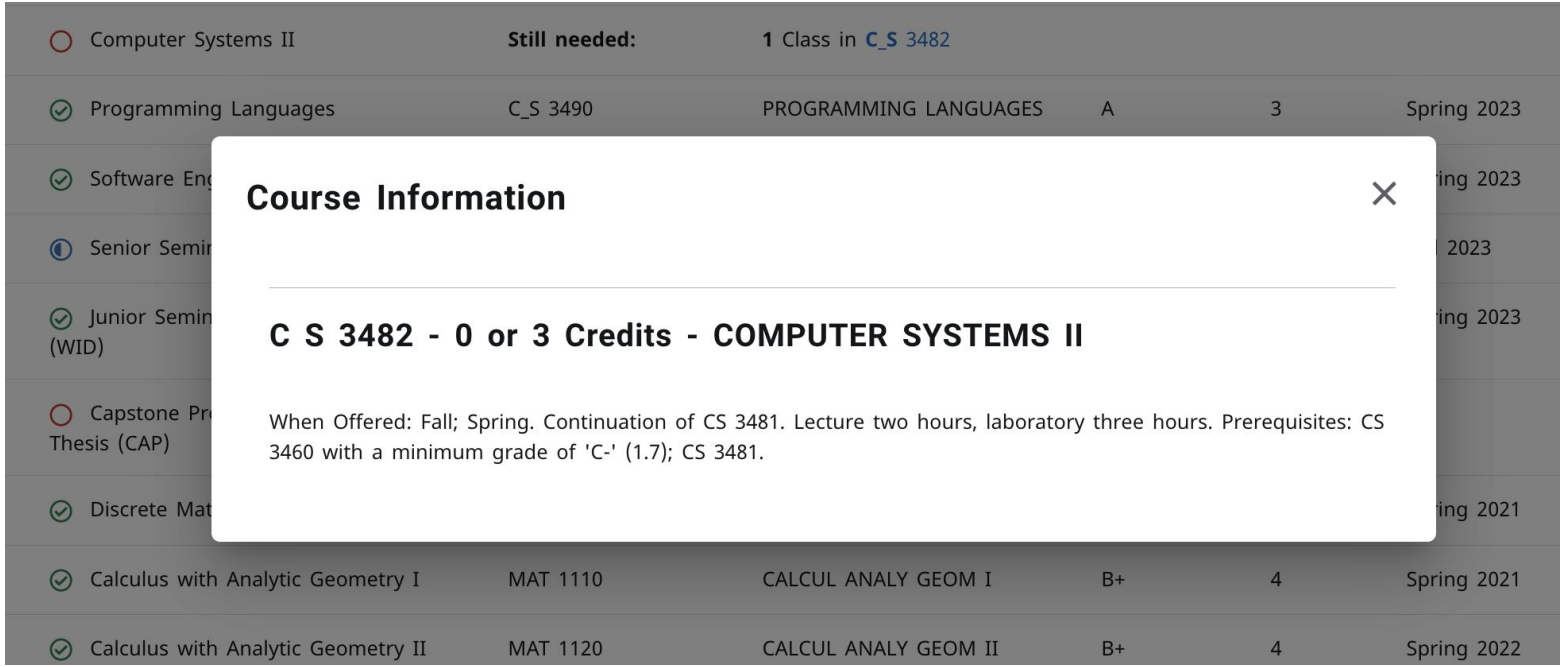
Major in Computer Science INCOMPLETE

Catalog year: 2020-2021

	Course	Title	Grade	Credits	Term	Repeated
Writing in the Discipline Course (WID)	ENG 3695	TECHNICAL WRITING FOR COMP SCI	A	3	Spring 2023	
Capstone Course (CAP)	**Still needed:**	Capstone Course still needed.				
MAJOR REQUIREMENTS						
Computer Science I	C_S 1440	COMPUTER SCIENCE I	A-	4	Spring 2021	
Computer Science II	C_S 2440	COMPUTER SCIENCE II	A-	4	Fall 2021	
Introduction to Computer Systems	C_S 2450	INTRO TO COMPUTER SYSTEMS	B-	3	Fall 2022	
Introduction to Theoretical Computer Science	C_S 2490	INTRO THEORETICAL CMP SC	B	3	Fall 2022	
Database	C_S 3430	DATABASE	A	3	Fall 2022	
Data Structures	C_S 3460	DATA STRUCTURES	B-	3	Spring 2022	
Computer Systems I	C_S 3481	COMPUTER SYSTEMS I	--	(3)	Fall 2023	

indicates a course
In progress



If you click on a course that you need to take, you will be shown the course description, including the prerequisites. Note the minimum grade requirements.

CS Electives

- CS major requires 12 hours of **CS electives**
- 3 hours of those can be from an internship
- Two math courses count for a CS elective (MAT 4310: Numerical Methods; MAT 4990: Numerical Linear Algebra)
- Each semester we offer special topics courses that count as CS electives

○ Computer Science Electives	C_S 4900	INTERNSHIP	S	3	Spring 2024
	Still needed:	**9** Credits in **C_S** 3240 or 3440 or 3463 or 3500 or 3515 or 3530:3549 or 3750 or 3760 or 3770 or 4435 or 4440 or 4450 or 4465 or 4521 or 4550 or 4570 or 4620 or 4680 or 4740 or 4755 or **MAT** 4310 or 4990			

Elective courses

- CS major also requires **7-9 hours of electives** be completed to get to 120 hours (these can be anything you want)
- Elective courses show up on degree works in the major block

Electives	BIO 1202	BIOLOGY IN SOCIETY II	APCR	3	Fall 2021
	Satisfied by:	BIO20 - BIOLOGY - Advanced Placement Credit			
	BIO 1203	BIOLOGY IN SOCIETY LABORATORY	APCR	2	Fall 2021
	Satisfied by:	BIO20 - BIOLOGY - Advanced Placement Credit			
	MAT 1025	PRECALCULUS	B	4	Fall 2021

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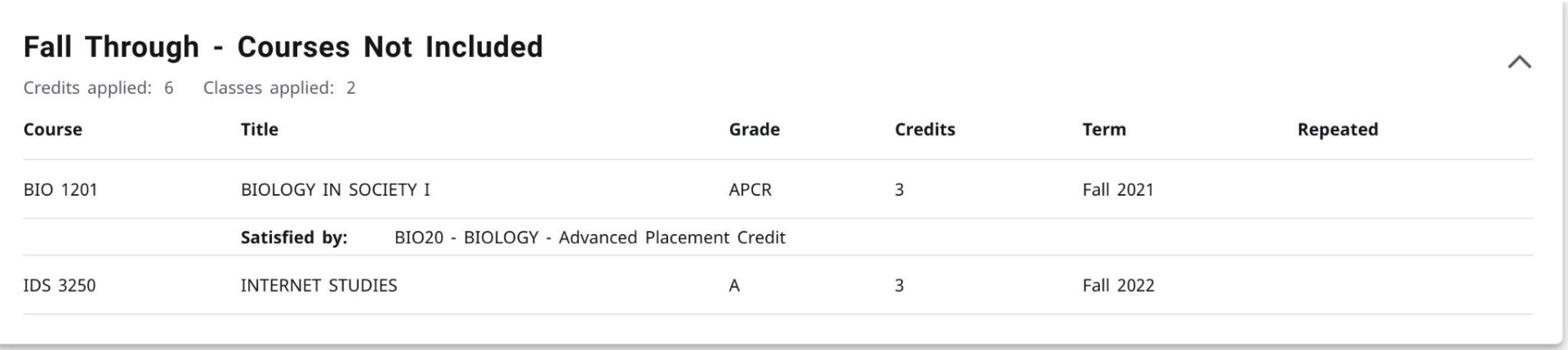
Fall through courses

- CS major: 44 hours of gen ed plus 67 to 69 hours for CS (depending upon science sequence) plus 7 to 9 hours of electives equals 120 hours
- Fall through courses are other courses taken by the student that are not needed for the CS major



Fall Through - Courses Not Included

Credits applied: 6 Classes applied: 2

Course	Title	Grade	Credits	Term	Repeated
BIO 1201	BIOLOGY IN SOCIETY I	APCR	3	Fall 2021	
	Satisfied by: BIO20 - BIOLOGY - Advanced Placement Credit				
IDS 3250	INTERNET STUDIES	A	3	Fall 2022	

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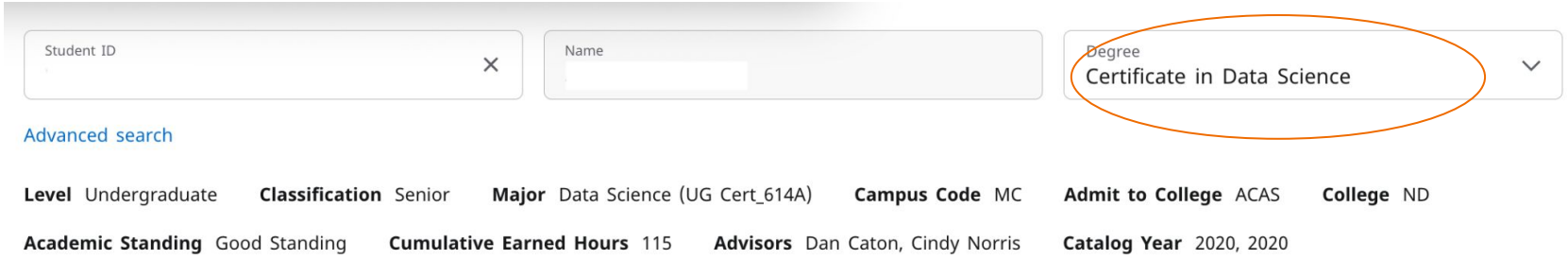
Minors and Certificates

- Degreeworks shows any minor requirements in a block below the display of major requirements
  - Computer doesn't require completion of a minor, but some degrees do
- If you are completing a certificate or another major, you can see those requirements after selecting it in the degree block



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Drops versus Repeats

- Career drop
  - Drop after the early drop-add period during the beginning of the semester before the end of the ninth week of the semester is called a “career drop”
  - Students are limited to a total of four "career drops" during their undergraduate careers at Appalachian State University.
  -
- Repeat
  - A retake of a course causes the first grade in the course to be forgiven
  - Students are allowed four repeats for four *different* courses

Should a I drop or repeat?

- If you are changing majors
  - Drop the course if you have drops available
- If you are out of drops
  - You can still drop if there are extenuating, documented circumstances
    - https://registrar.appstate.edu/students/withdrawal-policy/late-or-retroactive-withdrawals
- If you are staying in the major
  - Repeating the course is reasonable
  - The grade you earn in the course the second time will replace your first grade
    - You don’t want to earn a lower grade in the second attempt!

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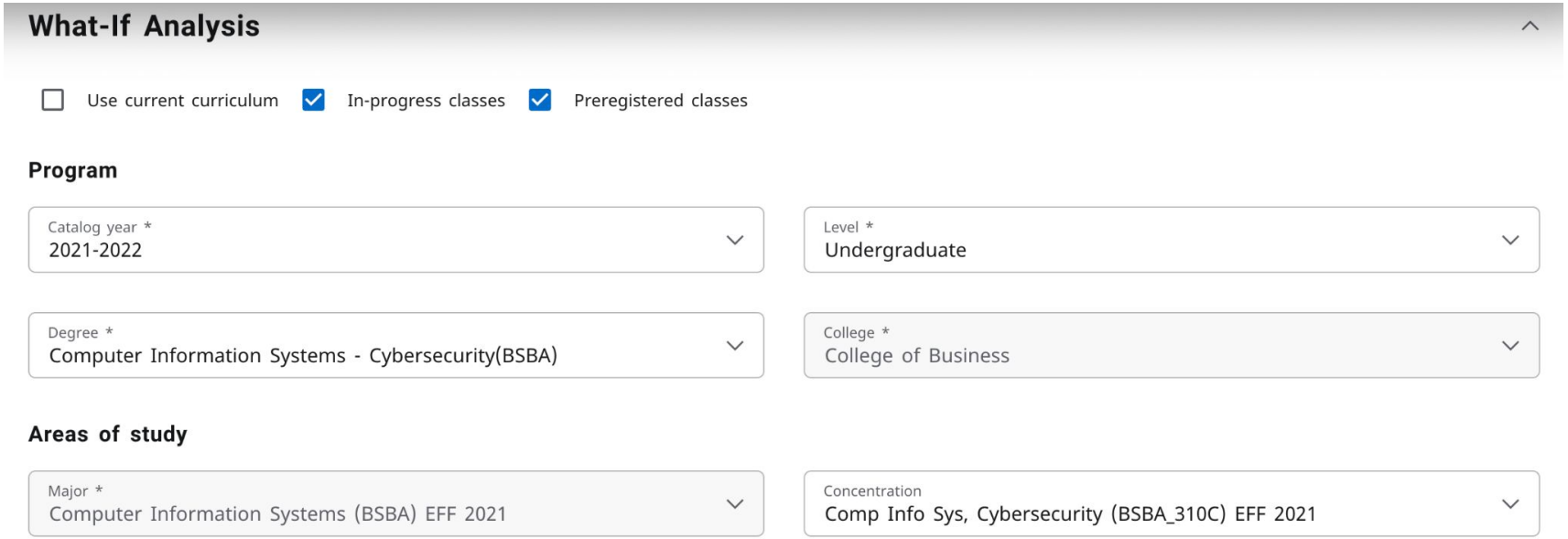
What-If Analysis

- Degree works what-if analysis allows you to see how close you are to finishing a different major



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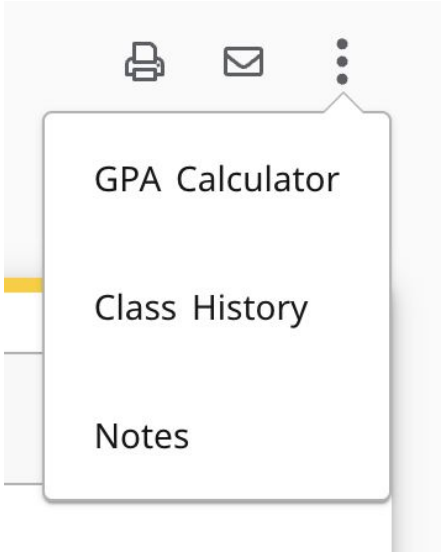
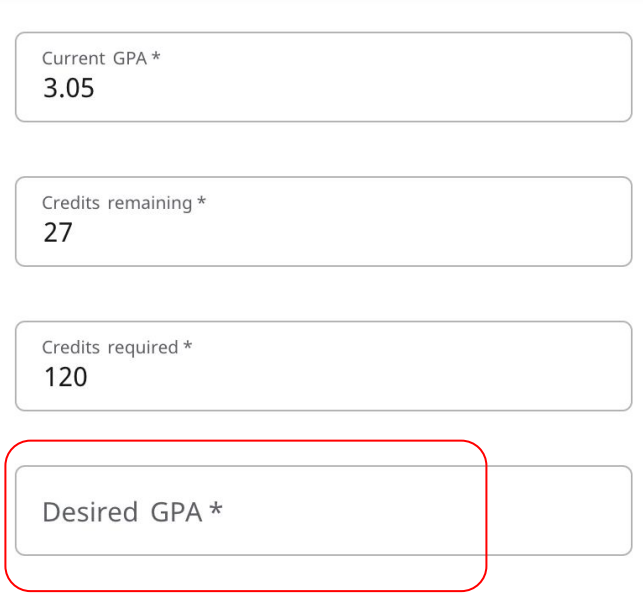
GPA Calculator

- Can be used to calculate the average grade you need to earn in order to each a target GPA





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Study Abroad

- Yes, Computer Science students can do a semester abroad
- The Office of International Programs will help you figure out how to have an enriching experience abroad while also meeting degree requirements

https://international.appstate.edu/education-abroad/starting-process

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Academic Option: Accelerated Bachelors to Masters

- If you have a GPA of 3.2 or above (or you're going to do the work to get it there), think about entering the Accelerated Bachelors to Masters Program
- During your senior year, you can take grad courses that count toward both your undergraduate degree and a future graduate degree
  - Up to 12 hours can double count

Students who graduate with an MS typically have better job opportunities than those with only a BS

For more information contact CS graduate program director:
Dr. Mitch Parry, parryrm@appstate.edu

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Academic Option: Data Science Certificate

- Data scientists extract meaningful insights from data using
  - statistics
  - algorithms
  - programming skills
- Data scientists use data to answer questions like:
  - Will this person renew their subscription?
  - What kind of car is this person likely to buy?
  - Is this a picture of a cat or a dog?

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Data Science Certificate Requirements

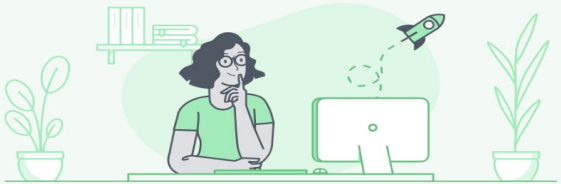
- Although the certificate is open to all majors, it is easier for CS majors to earn because of the significant overlap in requirements
- Requirements:
  - **CS 2435:** Introduction to Scientific Programming (Programming in Python)
    - CS 2440: Computer Science II can be a substitute
  - **Math 2240**: Linear Algebra
    - Required for CS major
  - **Stat 3850**: Statistics
    - Required for CS major
  - **CS 3435**: Data Acquisition and Visualization
    - *The one "extra" course, but it also contributes to the 120 hours needed to graduate*
  - **CS 4755**: Applied Machine Learning
    - Counts as CS elective (12 hours of CS electives required for CS major)

Why Data Science Certificate?

50 Best Jobs in America for 2022

Best Places to Work | Top CEOs | **Best Jobs** | Best Cities for Jobs | Highest Paying Jobs | Share

2022 | United States



Discover Glassdoor's Best Jobs in 2022

Using Glassdoor's unique data on jobs, salaries, and companies, we compiled a list of the 50 Best Jobs in America to help people find jobs they'll love. Each job stands out for its earning potential (median salary), job satisfaction, and job openings. Are you considering a new position? Check out this comprehensive list to see what jobs made the list this year, and view open jobs at companies across the country.

	Job Title	Median Base Salary	Job Satisfaction	Job Openings	
#1	Enterprise Architect	$144,997	4.1/5	14,021	View Jobs
#2	Full Stack Engineer	$101,794	4.3/5	11,252	View Jobs
#3	Data Scientist	$120,000	4.1/5	10,071	View Jobs

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Academic Option: Department Honors Program

- To graduate with Honors in Computer Science, a student must:
  - Earn a minimum of 9 hours of honors credit:
    - 6 hours of honors courses in Computer Science
    - 3 hours of honors thesis/project (instead of Capstone)
  - Possess a minimum GPA of 3.45 in the Computer Science major upon graduation
- Graduate courses count as Honors courses
  - Take Graduate courses to graduate with honors and simultaneously work toward earning the Master's degree

Why Honors?

- Richer, more in-depth educational experience
- Interested in becoming a faculty member in higher education?
  - PhD required by most institutions
  - PhD generally requires writing a thesis
  - Honors provides the opportunity to write a thesis
- Interested in becoming a Researcher in academia or industry
  - Honors provides the opportunity to perform research under the guidance of a faculty member

For more information contact CS department honors program director:
Dr. Mark Hills, hillsma@appstate.edu

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Academic Options: Minors

Math minor

- MAT 1120: Calculus II plus 9 more hours
  - MAT 2240: Linear Algebra
  - MAT 4310: Numerical Methods (counts as CS elective)
  - MAT 2310: Computation Mathematics (prerequisite to MAT 4310)

You can get the Math minor with one extra course: MAT 2310

Cybersecurity minor

- 15 hours of coursework (five courses)
- https://cis.appstate.edu/cybersecurity/cybersecurity-minor
- Two CS courses count toward that minor:
  - CS 3760: System Administration and Security
  - CS 4450: Data Communications and Networking
  - These courses aren't offered every semester so don't delay taking them if you have a chance

Minors

- CS is a good combination with many fields
  - CS + Biology = computational biology/bioinformatics
  - CS + Chemistry = computational chemistry
  - CS + Psychology = user experience design
  - CS can also be a good blend with fields in the arts and humanities
    - Interested in History?
      - A degree in CS can help you better collect and organize historical data
- Don’t be afraid to combine your CS degree with another passion

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Adding/changing major/minor/certificate

- https://cas.appstate.edu/advising/student-forms has a link to a form that will allow you to
  - change your major to another major in the College of Arts and Sciences
  - add a minor or certificate
  - drop your major, minor, or certificate
  - change your catalog year (however, that has been no significant change to CS major since 2019)
- If you want to add a major in another college, you need to see advising in that college
  - For example, if you want to change your major to cyber security or computer information systems see: https://businessadvising.appstate.edu/

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Internships

- Internships provide real-life experiences at partner colleges or industries
  - Often an internship will lead to a job offer upon completion of a degree
- Spring 2023 graduates
  - 66% of graduates sought an internship
  - 62% of those seeking an internship were able to obtain one
- CS 4900 Internship course is an approved Computer Science elective!
  - 18 interns in CS 4900 last summer, 10 last academic year
- Lots of variety
  - Big company, small company
  - On-site experience, remote experience
  - Local company, regional company, “West Coast” company (San Francisco, Seattle)

All of you should be looking for an internship at some point in your academic career. Typical time to look is in the fall/spring of your junior year (internship in summer after junior year)

How to find an internship

- https://cs.appstate.edu/internships/
  - Sign up to get emails about flyers
  - Look at recent internship organizations
- Club meetings
- Handshake: https://careers.appstate.edu/handshake
- App State Career Center job and internship fairs
- Linked In
- Indeed
- Don’t miss local opportunities; websites for churches, non-profits, etc.

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Scholarships

- There are several scholarship programs:
  - Department scholarship page: compsci.appstate.edu/scholarships
    - ECRS - funded by the local ECRS company
    - S-STEM - funded by the National Science Foundation (NSF)
  - Appstate scholarships portal: asap.appstate.edu
    - Portal allows you to apply for multiple scholarships with one application
    - Open to applications in early December

Pay attention to emails from Dr. Fenwick about scholarships!
As the saying goes, we don't want to leave money on the table.

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How many classes should I take?

- You will need a minimum of 120 hours to graduate with a Computer Science degree
  - 15 hours a semester for eight semester
- Financial aid requires you are full-time to receive full aid
  - 12 hours in a fall/summer semester is considered full-time
  - 6-7 hours in a summer session is considered full-time
- What if you want to take more than 15 hours?
  - 18 hours in fall/spring (7 hours in a summer session) are allowed
  - Beyond that, special permission is required from the Dean’s office

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Registration

- Register via: appalnet.appstate.edu
- You'll need your six-digit Alternate PIN to register
  - Obtain from your advisor or via group advising session
- Registration will open for you based upon your number of earned hours
  - More hours = earlier time
- To see when you can register:
  - appalnet.appstate.edu
  - Self-service
  - Student
  - Registration
  - View your Registration Time

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Prerequisites

- If the course is a clickable link in degree works, then clicking on it will show the prerequisites, for example:

- Some prerequisites can be viewed here: https://compsci.appstate.edu/academics/undergraduate-program/prerequisites
- Also prerequisites can be seen in the current bulletin: https://bulletin.appstate.edu/index.php?catoid=34
    - Note the current bulletin prerequisites apply, regardless of your catalog year

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Applying for graduation

- Graduation is not the same as commencement
  - You don't need to participate in commencement to graduate
  - You do need to apply for graduation in order to graduate
  - You do need to be enrolled in at least one class in the semester you graduate
- You should apply for graduation the semester *before* the semester in which you plan to graduate
- Apply to graduate via appalnet. Detailed instructions can be found here: https://registrar.appstate.edu/graduation/graduation-application-instructions

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Spring 2025 Computer Science courses

- Every required course is offered every fall and spring semester
- Elective courses loosely follow the schedule indicated in the bulletin
- To see what is actually offered, you need to check the registrar's site:
  - https://bannerxe.appstate.edu/StudentRegistrationSsb/ssb/classSearch/classSearch
- The next set of slides describes each of the CS elective courses offered in the Spring 2025 semester
  - Some elective courses also count for the CS 4755: Applied Machine Learning requirement for the Data Science certificate.

CS 2531: Computational Reasoning

From the most elementary hardware to the most sophisticated software, all of computer science is based in discrete mathematics. This course covers a range of topics in discrete mathematics that are particularly important in computer science, emphasizing relationships between certain mathematical structures on the one hand, and their applications in computer science on the other. But since it treats mathematical knowledge as primary rather than as something to be picked up ``on the fly", this course provides an opportunity to focus on building a solid mathematical foundation for computer science. This is important --- after all, no computer scientist has ever said that they wished they had less mathematical background or understood mathematics less well! Specific topics to be covered include propositional logic, predicate logic, proof techniques, basic set theory, functions, relations, counting principles, inductively defined sets, inductive proof, and recursive definitions.
Prerequisite: permission of instructor

Professor: Patricia Johann

CS 3532: Competitive Programming

Competitive programming is all about solving mathematical and computational problems. In this course, we look at various problem solving paradigms to tackle a wide variety of fun and interesting problems. The skills developed in this course reinforce skills such as problem solving, rapid prototyping, and programming proficiency. We meet for three hours, one hour for a lecture on a topic related to competitive programming, then one hour to work on a handful of problems alone or in small groups, and then an hour to go over solutions to proposed problems. This covers topics such as advanced data structures, graph algorithms, string matching, and programming paradigms such as complete search, divide and conquer, and dynamic programming. **Prerequisite:** CS 3460: Data Structures

Professor: Chad Waters

CS 3537: Cloud Computing

In this course we will cover a number of topics relevant to cloud computing. This will include different cloud service models; cloud administration and security; cloud storage; software architectures related to, or enabled by, cloud; cloud application support; DevOps; and APIs. Upon completion of this course each student will be able to: compare and contrast different service models for cloud computing, e.g., IaaS, PaaS, SaaS; configure and administer security, billing, networking, and logging for cloud services; select and configure appropriate storage solutions for cloud applications, including file-based, relational/SQL, and NoSQL storage alternatives; utilize cloud services to support typical application execution scenarios; configure and use DevOps build pipelines, including support for application build, automated test, containerization, and deployment; and use and create RESTful APIs. **Prerequisites:** CS 3430: Database and CS 3667: Software Engineering

Professor: Mark Hills

CS 3540: Single Page Applications

This is an advanced front-end web development course. Students will code with TypeScript in the Angular Framework and learn to create fast, responsive, and well structured websites. **Prerequisite:** 2440 with a C or higher. Client-Side (3440) or some web development experience is recommended but not required. This course will count as a prereq for CS 4435: Server-side Web Programming.

Professor: Jay Fenwick

CS 4435: Server-side Web Programming

This course introduces the technologies for implementing secure, high performan and sophisticated web sites. Topics may include: installation and configuration a web server, client/server web applications with database backends, web develo frameworks, web services, web data formats, and content management systems. **Prerequisites**: CS 3430 and CS 3440.

Professor: Joel Swanson

CS 4440: Artificial Intelligence

This course covers various topics in artificial intelligence. Topics may also include knowledge representation and manipulation, heuristic programming, expert systems, robotics, machine learning, or natural language processing. Prerequisite: CS 3460 with minimum grade of C- (1.7) or CS 3435; STT 3850.

Professors: Mohammad Ali Javidian and Yeganeh Madadi

This course also counts for the CS 4755: Applied Machine Learning requirement for the Data Science certificate.

CS 4521: Operating Systems

An in-depth study of the design and implementation of operating systems including process management, memory management, file systems, and input/output. Lecture three hours, laboratory three hours. **Prerequisite**: CS 3482. This course is cross-listed with **CS 5521: Operating Systems**. Only seniors will be able to register for this course.

Professor: Cindy Norris

CS 4541: Causal Inference

This course provides an introduction to causal inference, focusing on both theory and practical applications. Using the textbook “Causal Inference in Statistics: A Primer" by Judea Pearl, Madelyn Glymour, and Nicholas P. Jewell, students will explore statistical and causal models, graphical models and their applications, the effects of interventions, and counterfactual reasoning. The course includes hands-on experience with real-world data, leveraging R packages like 'bnlearn' and 'pcalg', as well as the Python library 'DoWhy' to implement causal inference methods in practice. This course is cross-listed with **CS 5770: Topics in Theoretical Computer Science**. Only **seniors** will be able to enroll in the course.

Professor: Mohammad Ali Javidian

CS 4541: Deep Learning

This course will cover topics in deep learning such as multilayer perceptrons, convolutional neural networks, recurrent neural networks, deep reinforcement learning, and generative adversarial networks. We will cover topics at a high-level first, then take a deep dive into neural networks mathematical foundations, culminating with team projects using TensorFlow. To succeed in this course you will need to write and debug your own programs; read, write, and interpret differential calculus and matrix/vector algebra; and work on a team to implement deep network architectures to solve problems. Note: This course will count for CS 4755 in the data science certificate program. Prerequisites: CS 3460 and MATH 2240 with a grade of C- or higher. This course is dual-listed with **CS 5750: Topics in Data Science & Visual Computing**. Only **seniors** will be able to enroll in the course.

Professor: Mitch Parry

This course also counts for the CS 4755: Applied Machine Learning requirement for the Data Science certificate.

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Spring 2025 Graduate Courses

- Senior (90 hours) with a minimum 3.0 GPA can take grad courses
- Graduate courses **count as CS electives** for the undergraduate CS degree
- Graduate courses count as honors credits:
  - Academic Options: Department Honors Program
- If you are in the Accelerated Master's Program then graduate course count toward both the undergraduate degree and the graduate degree:
  - Academic Options: Accelerated Bachelors to Masters
- To register for a graduate course, you need to complete the Request for Special Permission Form:
  - https://graduate.appstate.edu/forms

CS 5521: Operating Systems

An in-depth study of the design and implementation of operating systems including process management, memory management, file systems, and input/output. **Prerequisite:** Equivalent of CS 3482 (Computer Systems II). Lecture two hours, laboratory three hours. [Dual-listed with CS 4521.]

Professor: Cindy Norris

CS 5667: Advanced Software Engineering

Review of the system life cycle. Software metrics. System engineering. Analysis and system specification. Object-oriented modeling. Computer-aided software engineering (CASE). Verification, validation and formal specification. Both individual and group projects are required. Prerequisite: CS 5666.

CS 5770: Topics in Theoretical Computer Science

This course provides an introduction to causal inference, focusing on both theory and practical applications. Using the textbook “Causal Inference in Statistics: A Primer" by Judea Pearl, Madelyn Glymour, and Nicholas P. Jewell, students will explore statistical and causal models, graphical models and their applications, the effects of interventions, and counterfactual reasoning. The course includes hands-on experience with real-world data, leveraging R packages like 'bnlearn' and 'pcalg', as well as the Python library 'DoWhy' to implement causal inference methods in practice. This course is cross-listed with **CS 4541: Casual Inference**.

Professor: Mohammad Ali Javidian

CS 5750: Topics in Data Science and Visual Computing

This course will cover topics in deep learning such as multilayer perceptrons, convolutional neural networks, recurrent neural networks, deep reinforcement learning, and generative adversarial networks. We will cover topics at a high-level first, then take a deep dive into neural networks mathematical foundations, culminating with team projects using TensorFlow. To succeed in this course you will need to write and debug your own programs; read, write, and interpret differential calculus and matrix/vector algebra; and work on a team to implement deep network architectures to solve problems. **Prerequisites:** CS 3460 and MATH 2240 with a grade of C- or higher. This course is dual-listed with **CS 4542: Deep Learning**.

Professor: Mitch Parry

This course also counts for the CS 4755: Applied Machine Learning requirement for the Data Science certificate.

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Spring 2025 Data Science courses

- Data Science courses can help you earn the Data Science certificate
  - Academic Option: Data Science certificate
- In the spring semester, the department typically offers **CS 3435: Data Collection and Visualization**
- Each semester, the department typically offers one or more data science courses that meet the **CS 4755: Applied Machine Learning** requirement for the Data Science certificate

CS 3435: Data Collection & Visualization

This class provides students an opportunity to develop skills to acces and organize data, scrape data from websites, determine and improve da and produce interactive graphical representations to help discover pat and answer questions. A class project will provide students the opport to apply their learning to a disciplinary problem. **Prerequisites**: CS 2440 or CS 2435.

Professor: Tinghao Feng

This course only counts for the Data Science certificate. It is **not** a CS elective. (However, it does count toward the 120 hours needed to graduate.)

CS 4440: Artificial Intelligence

This course covers various topics in artificial intelligence. Topics may also include knowledge representation and manipulation, heuristic programming, expert systems, robotics, machine learning, or natural language processing. Prerequisite: CS 3460 with minimum grade of C- (1.7) or CS 3435; STT 3850.

Professors: Mohammad Ali Javidian and Yeganeh Madadi

This course counts for the CS 4755: Applied Machine Learning requirement for the Data Science certificate. It **also counts** as a CS elective.

CS 4541: Deep Learning

This course will cover topics in deep learning such as multilayer perceptrons, convolutional neural networks, recurrent neural networks, deep reinforcement learning, and generative adversarial networks. We will cover topics at a high-level first, then take a deep dive into neural networks mathematical foundations, culminating with team projects using TensorFlow. To succeed in this course you will need to write and debug your own programs; read, write, and interpret differential calculus and matrix/vector algebra; and work on a team to implement deep network architectures to solve problems. Note: This course will count for CS 4755 in the data science certificate program. Prerequisites: CS 3460 and MATH 2240 with a grade of C- or higher. This course is dual-listed with **CS 5750: Topics in Data Science & Visual Computing**. Only **seniors** will be able to enroll in the course.

Professor: Mitch Parry

This course counts for the CS 4755: Applied Machine Learning requirement for the Data Science certificate. It **also counts** as a CS elective.

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Summer 2025 Computer Science courses

- Registration for summer 2025 courses is in the spring
- Summer courses can span
  - Summer session 1 (five weeks of May - June)
  - Summer session 2 (five weeks of July - August)
  - Both sessions (ten week courses spanning both sessions)

Session 1: CS 1100: Discrete Mathematics

A study of discrete mathematics as it applies to computer science. Concepts covered include number systems, sets, logic, Boolean algebra, digital circuits, combinatorics, relations, functions, vectors, matrices, graphs, and induction proofs. **Prerequisite:** MAT 1025 or equivalent with a grade of "C-" (1.7) or higher or satisfactory. Calculus Readiness Test score.

Professor: Danielle Lapensee-Rankine

Note: This course will be offered **synchronous online**

Session 1: CS 2490: Introduction to Theoretical Computer Science

This course provides a rigorous but intuitive introduction to computer theory. Topics covered include formal languages, regular expressions, finite automata, grammars, pushdown automata, and Turing machines.
Prerequisites: CS 1100 and CS 2440 with a minimum grade of "C" (2.0) in each.

Professor: Val Lapensee-Rankine

Session 1: CS 3534: Introduction to Robotics

Description to come.

Professor: Yeganeh Madadi

Note: This course will count as a CS elective

Session 1: CS 3543: Theory of Computation

This course describes models of computation, polynomial time, undecidability and intractability, time and space complexity, through a rigorous treatment of Turing machines. Prerequisite: CS 2490.

Professor: Pierre Cagne

Note: This course will count as a CS elective.

Note: This course will be offered **synchronous online**

Ten Weeks: CS 1440: Computer Science I

A first programming course using an object-oriented language. Emphasis is placed on problem-solving and appropriate programming standards. Topics include: classes, objects, data types, expressions, conditional statements, loops, strings, arrays, collections, debugging, inheritance, and polymorphism. Lecture three hours, laboratory two hours. Students with doubts about their mathematics and computing background should consider taking CS 1425 first. Prerequisite: MAT 1025 or equivalent with a minimum grade of "C-" (1.7) or higher or satisfactory Calculus Readiness Test score.

Professor: Abdelbaset Hamza

Note: This course will be offered **synchronous online**

Ten Weeks: CS 2440: Computer Science II

This course follows CS 1440 - Computer Science I (4). The course introduces students to advanced programming concepts through the development of small to medium sized projects using software component libraries. Topics emphasize conceptual understanding and applications and include inheritance, polymorphism, recursion, interfaces, collections, stream I/O, exceptions, graphical interfaces, and threads. Lecture three hours, laboratory two hours. **Prerequisite:** CS 1440 or CS 2435 with a minimum grade of "C" (2.0). **Corequisite**: CS 1100.

Professor: Courtney Dixon

Note: This course will be offered **synchronous online**

Ten Weeks: CS 2450: Introduction to Computer Systems

This course includes data representation, digital logic, digital circuits, instruction set architecture, and assembly language programming.
Prerequisites: CS 1100 and CS 2440 with a minimum grade of "C" (2.0) in each.

Professor: Joel Swanson

Note: This course will be offered **synchronous online**

Session 2: CS 3430: Database

This course covers the design, organization, representation, and manipulation of databases. Topics include the relational model, data definition, data manipulation, queries (SQL), communication and representation (XML), design concepts, security, and integrity. Prerequisite: CS 2440 with a grade of "C" (2.0) or higher.

Professor: Tingaho Feng

Session 2: CS 3460: Data Structures

Data Structures is the study of organizing data in memory in order to access them efficiently. In this class, we study data structures for storing sets and sequences in the form of arrays, linked lists, stacks, queues, priority queues, hash tables, and binary search trees. We also learn the art of abstraction by treating these data structures as black boxes to solve more complex algorithms. Data structures are vital in almost every field of computer science, and we cover applications in text compression, security, parsing, and more. We learn to model certain problems as a graph, and study graph algorithms for traversing and computing shortest paths.
Prerequisite: CS 2490 with a minimum grade of “C” (2.0).

Professor: Mohammad Ali Javidian

Session 2: CS 3667: Software Engineering

This course covers the design and implementation of software systems. Topics include requirements analysis, object design, system design, frameworks and patterns, and implementation and testing issues. **Prerequisite**: CS 2440 with a grade of "C" (2.0) or higher.

Professor: Nazia Sharmin

Note: This course will be offered **synchronous online**

Session 2: CS 3537: Program Analysis

The focus of the course will be on static program analysis, especially focused on tasks related to program comprehension/understanding. The course will start with an overview of the needed background in programming languages, especially focused on concepts needed to understand language front-ends. After this, the course will include a mixture of paper discussions and short lectures to provide information on topics discussed in the papers. Students will complete a short project, which will either be a replication based on existing work, or a new project in collaboration with the instructor. Projects will most likely be individual or two-person teams, depending on the topics chosen, the number of students, and student interest. Students will be expected to present their work during the course.
Prerequisite: CS 3460 with a minimum grade of "C"

Professor: Mark Hills

Note: This course will count as a CS elective

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Completion Form

To finish, fill out this advising completion form.

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